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Bactericidal Effects of a Prosthesis Cleaning Tablet

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Background: Hygiene and maintenance of removable prostheses are very important for the oral health. Elderly patients are not capable of this affair since they might have diseases in addition to being old; thus, they require new alternative methods.
Objectives: The purpose of this study was to compare the disinfecting effects of three substances, water, normal saline and denture cleaning tablets Corega that patients commonly use as denture cleaning, against oral bacterial infections.
Patients and Methods: In this study, complete maxillary dentures of 138 elderly individuals living in a nursing home (46 females and 92 males) with a mean age of 9 ± 75 years were studied. Their prostheses were soaked for 15 minutes randomly into one of the following substances: water, normal saline, or a solution containing denture cleaning tablets (Corega). Before and after this operation, samples were obtained by a third person using microbiological studies swabs. The samples were cultured and the colony forming units (CFU) were obtained. Data were evaluated by one-way ANOVA test.
Results: Statistically, Corega reduced bacterial infections significantly more than water and normal saline (P = 0.0001). Water and normal saline had equal effects on reducing CFU.
Conclusions: Denture cleaning tablet, Corega, is recommended for cleaning the prostheses, but using water or saline alone is not recommended.

Keywords: Oral Hygiene; Denture Cleansers; Bacterial Infection

1. Background

Despite all the new therapies in dentistry, complete edentulous remains as one of the shortcomings in which many elderly people are involved. The number of people who have this problem is growing due to the increasing world population age. Complete denture replacement is one of the most common treatments for this problem (1). Complete denture replacement changes the bacterial flora of the mouth, and since this treatment is used mostly in elderly patients with low physical abilities and low immunity and those who usually have systemic diseases requiring medical treatments, it changes the balance of mouth microflora and increases the colony forming unit (CFU), and thus, may cause oral infections (1-6).

As we know, oral bacterial infection may be a cause of bacterial endocarditis (7), pneumonia (8, 9) and chronic pulmonary obstructive diseases (10, 11), which indicates a direct relationship between oral hygiene and general body health (12). Unfortunately, rate of oral hygiene care in elderly Iranians has been lower than other populations (13-15).

Oral hygiene is unfavorable in elderly care centers for various reasons, including physical and mental disabilities, lack of motivation for cleaning, and tendency to use the prostheses all the time to communicate with the nurses, because the patients require around the clock care (16, 17). In addition, nurses barely cooperate for cleaning the dentures (16). Therefore, appropriate substances and methods should be selected to have the maximum effect in the minimum time and they should also be applicable by incapable patients and nurses with the least complexity and cost.

2. Objectives

The purpose of this study was to compare the disinfecting effects of three substances, water, normal saline and denture cleaning tablets called Corega, against oral bacterial infections.

3. Patients and Methods

In this study, after fully coordinating the officials of three nursing homes, providing complete explanations

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to the patients who used complete maxillary and mandibular prostheses, and taking informed consents, complete maxillary dentures of 138 elderly individuals were selected and randomly put into three groups: A (n = 46), B (n = 44), and C (n = 48). For cleaning the prostheses of groups A, B and C, water, normal saline, and Corega tablets (Glaxo Smith Kline®, Ireland) were prescribed, respectively.

At first, samples of the internal parts of prostheses from the posterior palatal parts and the anterior flanges were obtained by a third person, using a sterile swab. Then, prostheses were placed in Corega solution, normal saline or water for 15 minutes according to their groups. After that, they were put under running water for 30 seconds and again samples were taken from the mentioned areas. The samples were separately placed in tubes containing 2 mL of trypticasein soy broth (TBS) solutions. The tubes containing samples taken before the cleaning were labeled A, B, or C and the ones containing samples taken after the cleaning were labeled A', B', or C'.

In the laboratory, sample culturing and CFU counts were performed by a third person who was blinded to the groups. At first, the tubes containing TBS were placed on electronic vibrofix for one minute so that their contents were thoroughly mixed. Then, 1 mL of each sample was taken and using 9 mL sterile normal saline, diluted solutions of 0.1, 0.01 and 0.001 were prepared. One mL of the 0.001 solution was transferred to a sterile Petri dish and 15 mL of sterile and cooled (50°C) tryptic soy agars (TSA) medium was added to it. After five rotational motions, the container was left on table for the medium to be fully dried. The Petri dishes were incubated at 37°C for 24 hours and the number of colonies was counted and reported by the same person. One-way ANOVA test was used for data analysis. Prior to obtaining the samples, the patients were asked whether they had washed their prostheses after breakfast and at the end we sought their opinions on any changes in the taste and smell of their mouths and prostheses. The patients and the laboratory microbiologists were unaware of the materials used in cleaning the dentures. The study protocol was approved by the Ethical Committee of Qazvin University of Medical Sciences.

4. Results

In this study, complete maxillary prostheses belonging to 138 individuals were examined. There were 46 (33.3%) female and 92 (66.7%) male patients. The highest prevalence of CFU was in the age group of 75-85 years old (39.1%) and the lowest was in the age group of less than 65 years old (2%) (Figure 1).

Only 26 of these people had cleaned their dentures on the sampling day morning and randomly 12 of them were placed in group A, seven in group B, and seven in group C; the mean values of CFU in the three groups did not have any significant statistical differences in this stage. As shown in Figure 1 before soaking the prostheses in the liquids, the rate of CFU was more than 10^8 in all the dentures, which indicates the poor oral health of the subjects and even the 26 people who had washed their dentures on the sampling daymorning were not really successful at

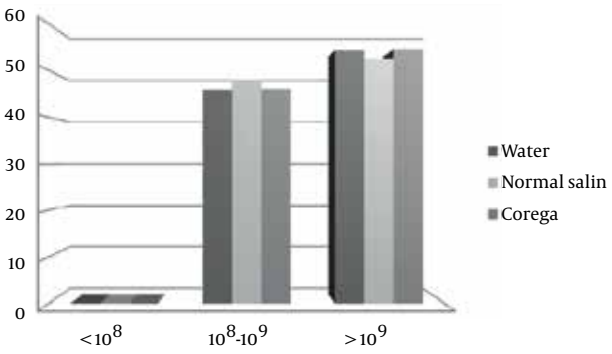

Figure 1. Relative Distribution of Colony Forming Unit in Each Group Before Denture Cleaning

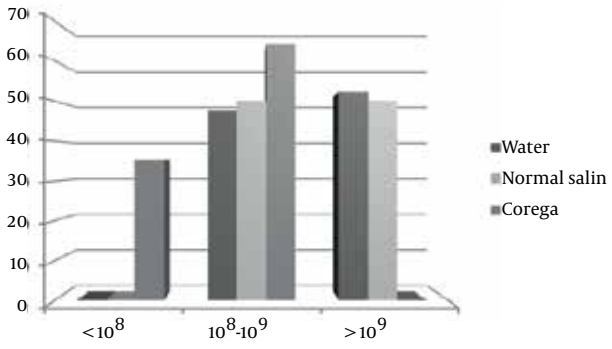

Figure 2. Relative Distribution of Colony Forming Unitin Each Group After Denture Cleaning

reducing the rate of CFU. After soaking the dentures in the three mentioned substances, the average CFU rate of group C was less than 10^9 and also the CFU count was zero in 17 cases (35.4%) (Figure 2). Meanwhile, only 40 people felt satisfied by the changes of their mouths and dentures odors and they were all in group C (85.4%); none of the people in other two groups felt this way. According to the statistical analysis, Corega cleaning tablets were significantly more effective than water and normal saline in reducing the number of bacteria (P = 0.0001), whereas the difference between the water and saline groups was not noticeable.

5. Discussion

According to the previous studies, the level of oral hygiene care in the elderly using complete removable dentures is low (13-15) and this issue is more common in patients staying at a nursing homes (16-18). In the present study, a complete denture witha CFU less than 10^8 was not observed among the total population, indicating the need for major decisions at the national level. The effects of the solution containing Corega cleaning tablets was much more than water and normal saline (P = 0.0001), removing the bacterial colonies in more than 35.4% of

cases. In most of the previous investigations, this effect has been observed in prostheses cleaning tablets (19, 20) and Corega (17, 18). With further studies, this substance can be used widely for the elderly as well as disabled people living in nursing homes, due to the advantages of chemical denture cleaning methods such as removing organic and nonorganic germs, ease of usage, reducing microbes, color and food from the surface of denture, no toxicity, and being inexpensive (17). It is also superior to mechanical methods which cover the whole surface and all the pores and the lack of surface erosion. It is superior to mechanical methods because its cover s the whole surface and pores and lack of surface erosion, and effects of these substances on anaerobic and Gram-negative bacteria has been proven (1). In nursing homes, normal saline is used for cleaning dentures. The present study showed that water and normal saline were almost ineffective in removing the bacteria from prostheses and they did not show any significant statistical difference.

Previous studies have shown that as the complete acrylic removable denture gets older, it becomes harder to remove the biofilms from its surface due to the increased surface roughness as well as the change in the acryl nature (1, 19). Therefore, immersion of complete dentures in soluble containing cleaning tablets for 15 minutes can only be effective on newly-formed biofilms (less than 24 hours). Therefore, some studies suggest longer immersion periods, even up to 24 hours, for full effectiveness (1, 17). Since CFU level reached to zero in more than 35.4% of the prostheses immersed in the soluble containing Corega cleaning tablets, the reason for less effectiveness on the rest of prostheses may be their longevity or presence of very old biofilm and germs. Therefore, it is suggested that in future studies, effects of these tablets should be considered regarding the longevity of dentures, hygiene and health care, presence of biofilm and old microbes, and the required immersion time for each prostheses according to its longevity. Since most of the bacterial pathogens accumulate on the tissues of maxillary prosthesis (1, 13), samples were prepared from these regions. Tablets from the alkaline peroxide group were used, which can remove germs and color from the prosthesis due to bubble formation and their ability to effervesce when put in water (1), whereas in some studies, no significant effect was seen for all denture cleaning tablets (17-19).

In this study, we did not face the usual limitations and problems of other cross over studies due to our access to a high number of samples (18, 20-22). In vivo and in vitro biofilm formations are significantly different (23) and their durability and adhesion strength are not the same (24); therefore, this study was conducted in vivo.

Recently, it has been determined that microwave radiations have effects on cell walls and therefore they destroy microorganisms (25). However, these microorganisms residues remain if microwave radiations are used solely and these residues have the ability to become alive and make a new generation which is usually resistant to medication, and thus, they are considered a threat to oral health and hygiene (26). Therefore, the method mentioned above should be used concurrently with mechanical and chemical methods to ensure its durability and effectiveness. We suggest studying the effects of these pills together with microwave radiations as well.

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